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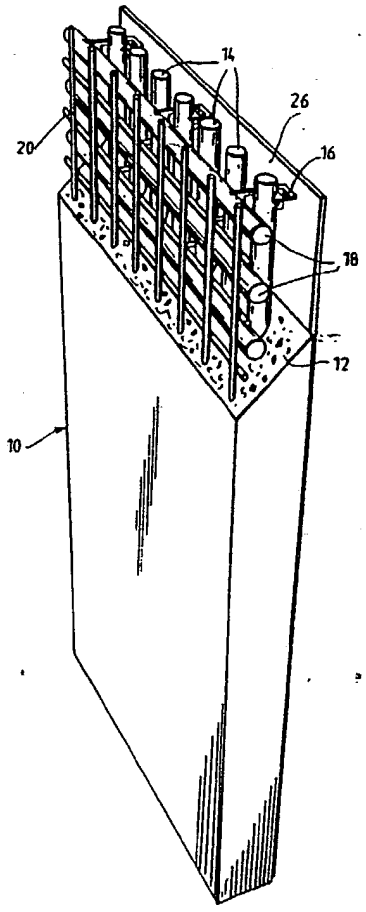
(57) Abstract

A modular vault (100) includes a series of panels (10) secured to a frame (102). Each panel (10) has a grid consisting of wire rope members (14) and reinforcing members (18, 20) secured together and located in hardened concrete (12). A hardened steel plate (26) is located on one side or both sides of the panel (10). The frame (102) consists primarily of T-section members (106, 118, 128, 136) which are assembled together, with the flange (138) of one member (136) locating in a slot (134) of another member (128) to form sub-frames (160, 162, 164, 166) into each of which a panel (10) may be bolted. Each member (106, 118, 128, 136) has a continuous portion (108, 174, 172, 138).



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MODULAR VAULT AND PANEL THEREFOR

This invention relates to a modular vault, and further elates to a panel for use with such a vault.

Many organisations, such as financial institutions and government departments, keep money, valuables, records and other documents and the like which must be protected from theft, fire, natural disasters and so on.

Such institutions normally make arrangements to protect material by housing and locking it within a burglary-resistant and/or fire-resistant safe or strongroom.

At present, such protection involves the use of a freestanding safe, the construction and use of an in situ concrete vault, or to purchase, install and use a prefabricated, demountable vault.

DE-A-2 614 968 discloses an example of a transportable, modular safe, which is built up of individual components, and may be dismantled.

The advantages of using demountable vaults arise from the fact that banks, examples of financial institutions, are tending to move away from purpose-built bank buildings, in which a strongroom or vault would be constructed in situ, to leased premises which may be occupied for only a relatively short period.

Clearly, the need for a vault or strongroom is just as great in leased premises, but it is uneconomical to construct and demolish in situ vaults to cater for such a requirement. Hence, the demountable or modular vault is attractive.

Existing demountable vaults have significant disadvantages for end users such as banks, as many modern buildings in which leased premises are found do not provide, as standard, floors with loadings which will permit the installation of conventional demountable vaults, with their large weight.

Furthermore, the individual panel sizes of existing demountable vaults are intrinsically quite large and very heavy in themselves, thus requiring as standard the use of cranes, fork lift trucks, or other lifting and transportation devices, to allow delivery and assembly to be accomplished, it will be readily apparent that the use of cranes or fork lift trucks, or other such heavy machinery, inside banking premises, would be awkward at the very least, and would depend on whether such lifting apparatus could actually enter the building in the first place. It follows that smaller and/or lighter panels offer handling advantages.

However, smaller panels may, because of their size, be prone to easier penetration

by bank robbers, armed with devices such as diamond core drills or other burglary implements.

It is an object of this invention to provide an improved panel for a modular vault, giving greater resistance to burglary.

It is also an object of this invention to provide an improved modular vault.

The invention provides a panel for a modular vault, said panel including a wire rope portion located therein.

The invention also provides a frame for a modular vault, including members connected together to form said frame, each member having at least one continuous portion.

An embodiment of the invention will be described in detail hereinafter, with reference to the accompanying drawings, in which:-

Fig. 1 is a perspective view of a panel in accordance with this invention;

Fig. 2 is a section through two connected panels used to form a wall, and a ceiling panel;

Fig. 3 is an enlarged sectional view through one panel;

Fig. 4 is a perspective view of a simplified panel of the type of Fig. 1, broken away to show material encapsulated in concrete;

Fig. 5 is an exploded view of an exemplary frame for a modular vault in accordance with the invention;

Fig. 6 is a perspective view of the assembled frame of Fig. 5; and

Fig. 7 is a perspective view of the assembled frame of Fig. 6, with some panels in place.

The panel 10 of Figs. 1 to 4 is intended to be used with the modular vault of Figs. 5 to 7.

The panel 10 is preferably formed from high hardness concrete 12, in which is encapsulated lengths of wire rope 14 of the type normally used in cranes, hoists and other heavy lifting apparatus.

It has been found, surprisingly, that the wire rope 14, for example 6/25 steel core lifting cable, resists penetration by a diamond core drill.

Within the panel, rope lengths 14 are preferably held in chairs 16, prior to pouring of the concrete. The chairs 16 are preferably connected to transverse reinforcements 18, to which is attached reinforcement 20, preferably a reinforcing mesh (Fig. 4). Preferred

sizes are 25mm diameter for wire rope 14, 25mm diameter for transverse reinforcements 18, and 6mm diameter for reinforcing mesh 20.

The wire rope lengths 14, and reinforcements 18, 20 are arranged in a grid (best shown in Fig. 4) having spacings for the various elements which ensure that a device such as a diamond core drill cannot penetrate between the elements. It is envisaged that 25mm diameter wire rope, spaced to desired criteria, within a 100mm thickness of hardened concrete, would provide excellent penetration resistance.

The panel 10 may also include sections of conventional concrete, and is preferably contained within a frame 22, which may be provided with notches 24 to accommodate bolts or the like.

Preferably, the panel 10 includes a backing sheet or plate 26 as a final barrier against an attempted penetration thereof. The sheet 26 is preferably of hardened steel, such as QISPLATE 500 BHN, the type usually used as a wear plate. However, any other type of steel may be used, depending on the level of security required by a particular end user. In certain cases, and subject to specific security requirements, an additional sheet of steel or hard plate could be applied such that it covers the outer surface also of each panel.

It is believed that a 6mm QISPLATE 500 BHN plate 26, with 100mm of hardened concrete, will provide a far greater penetration resistance to a device such as a diamond core drill, than a conventional 150mm hardened concrete panel or wall. However, it will be both thinner and lighter than conventional panels, and is intended (as will be described hereinafter) to be a 'half-height' panel, which renders it even lighter, and makes it transportable by means far smaller and less powerful than a crane or a fork lift truck.

By way of contrast, conventional demountable vaults must use larger panel sections which overlap and which are bolted or welded directly one to another.

Although reference has been made to panel 10 having superior resistance to attack using a diamond core drill, there are many other ways whereby an intruder may attempt to breach a vault or safe. As it is standard industry knowledge that the diamond core drill is one of the most difficult weapons against which to protect, and it is also the item most commonly used against demountable vaults. Other weapons of attack are not referred to herein, but would be known to any skilled practitioner of the art.

Fig. 5 shows a partly assembled frame 102 for a modular vault 100. The form of room or vault 100 shown is entirely exemplary, and clearly in use opening 104 would have a door located therein, the door being preferably formed much the same as the remainder

of frame 102.

The frame 102 is based on T-sections which in general slot together and may then be bolted, welded or otherwise secured together.

One example of a T-section member is base member 106, which has an upstanding flange 108 and a base web 110. Members 12, 114, 116 are similar.

Vertical T-section members such as 118 are located on a base member (in this case 106). A vertical slot (not shown) allows member 118 to seat over flange 108.

At the top of the frame, members similar to the base members are provided, except that those (120,122) comparable to members 106, 116 are provided with gaps 124, 126 to accommodate central roof member 128.

Member 128 is a T-section member, with a strengthening member 130 located on the underside thereof. Stem flange 132 of member 128 has a centrally-located slot 134 therein, to accommodate lateral member 136, in particular the stem flange 138 thereof.

Member 136 is also a T-section member, but there is a gap 140 between web sections 142, 144, and a further gap (146,148) between the outer end of each section 142, 144 and the respective outer ends of flange 138.

It can be seen that members 150, 152, 154, 156 and 158 are identical to, or conceptually similar to, member 136.

The gaps 140, 146, 148 are selected such that when member 128 is located on the partial frame 102 of Fig. 5, member 136 will sit on frame 102 and member 128 to define a series of sub-frames 160, 162, 164 and 166 (Fig. 6) for location of panels 10.

Member 150, in similar fashion, locates on member 118, in that flange 168 of member 150 locates in slot 170 of member 118, to form more sub-frames.

It will be noted that all of the frame 102 members are continuous across or down a particular wall or ceiling frame portion. Member 136 has a continuous portion in flange 138, 150 has a continuous portion in flange 168, member 128 has a continuous portion in web 172 and member 118 has a continuous portion in web 174.

This imparts particular strength to frame 102, and of course preferably the material of all frame 102 members is suitably strong. A hard steel is preferred.

In Fig. 5, the frame 102 members have all been located and secured together. Apertures 176 are provided in webs and flanges of some members, to allow for the fixing of panels 10. The various sub-frames (such as 160, 162) can be seen.

In Fig. 7, a number of panels has been located in sub-frames. In particular, a panel

10 has been located in sub-frame 160. Bolts (not shown) which are blind to top surface 178 (see also Fig. 3) are located through grooves 24, through apertures in the plate 26 side of panel 10, through apertures 176 of frame 102 members, and nuts are firmly done up from the inside. Of course, other types of fastening members could be used.

Thus, the modular vault 100 may be easily assembled and disassembled, the frame 102 has continuous members to add to its strength, and the half-height panels 10 are both relatively light (allowing east of movement thereof) and extremely strong, with the concrete-encapsulated wire rope 14 lengths.

CLAIMS

1. A panel for a modular vault, said panel including wire rope portion located therein.
2. A panel according to claim 1, wherein there is a plurality of wire rope portions, which are located in concrete.
3. A panel according to claim 2, wherein at least portion of said concrete is hardened concrete.
4. A panel according to claim 2, or claim 3 wherein said wire rope portions are part of a grid including concrete reinforcements.
5. A panel according to claim 4, wherein each of said wire rope portions is supported by a respective claim forming part of said grid.
6. A panel according to any preceding claim, also including a sheet of penetration-resistant material.
7. A panel according to claim 6, wherein said sheet is formed from hardened steel.
8. A panel according to any preceding claim, wherein said wire rope portions are arranged with a spacing calculated to resist penetration of said panel.
9. A panel according to claim 8, wherein said portions are arranged generally parallel and generally in straight lines.
10. A frame for a modular vault, including members connected together to form said frame, each member having at least one continuous portion.
11. A frame according to claim 10, wherein at least some of said members have a T-section profile.
12. A frame according to claim 11, wherein the continuous portion is the flange representing the stem of the T-section.
13. A frame according to claim 11, wherein the continuous portion is the web representing the top of the T-section.
14. A frame according to any one of claims 10 to 13, wherein the non-continuous portion includes at least one slot or gap, which is adapted to receive portion of another one of said members.
15. A modular vault including the frame of any one of claims 10 to 14.
16. A modular vault according to claim 15, further including at least one panel according to any one of claims 1 to 9.
17. A modular vault including at least one panel according to any one of claims 1 to 9.

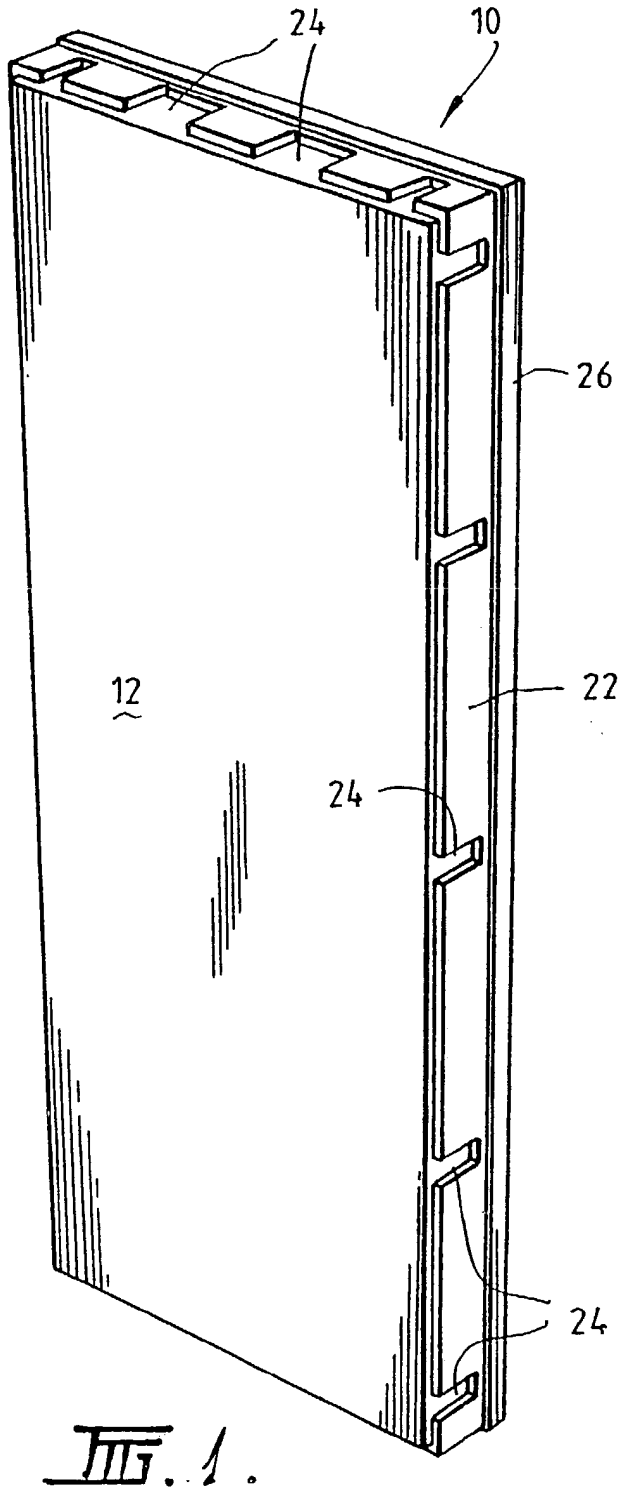
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FIG. 1.

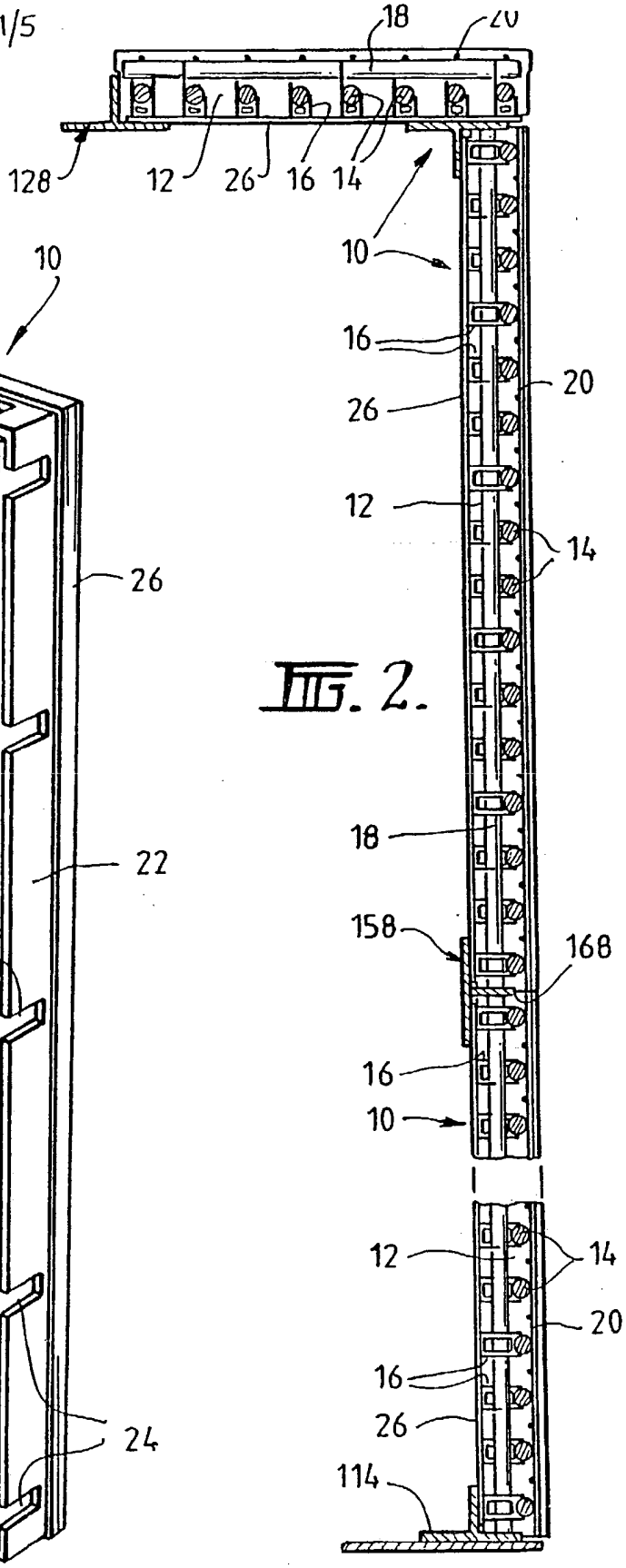
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FIG. 2.

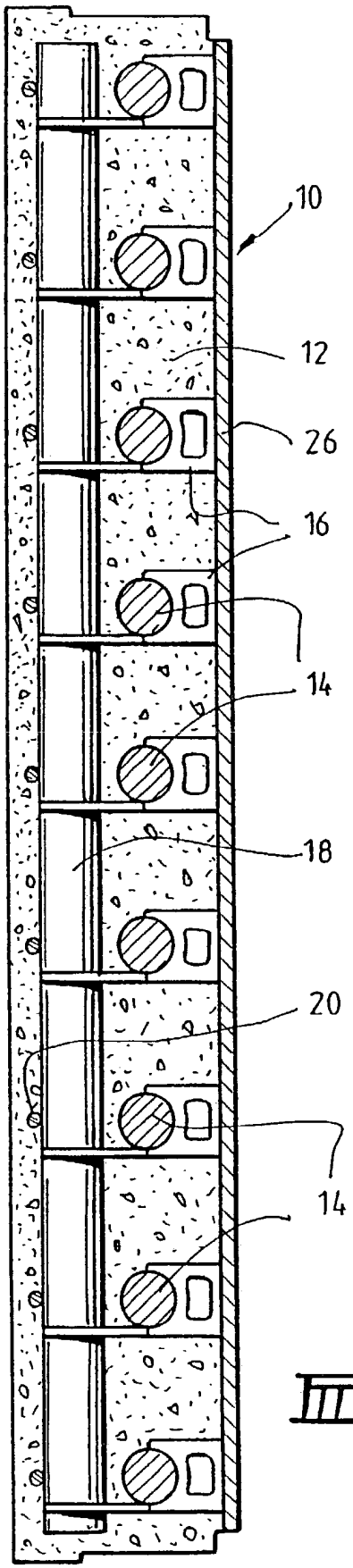

FIG. 3.

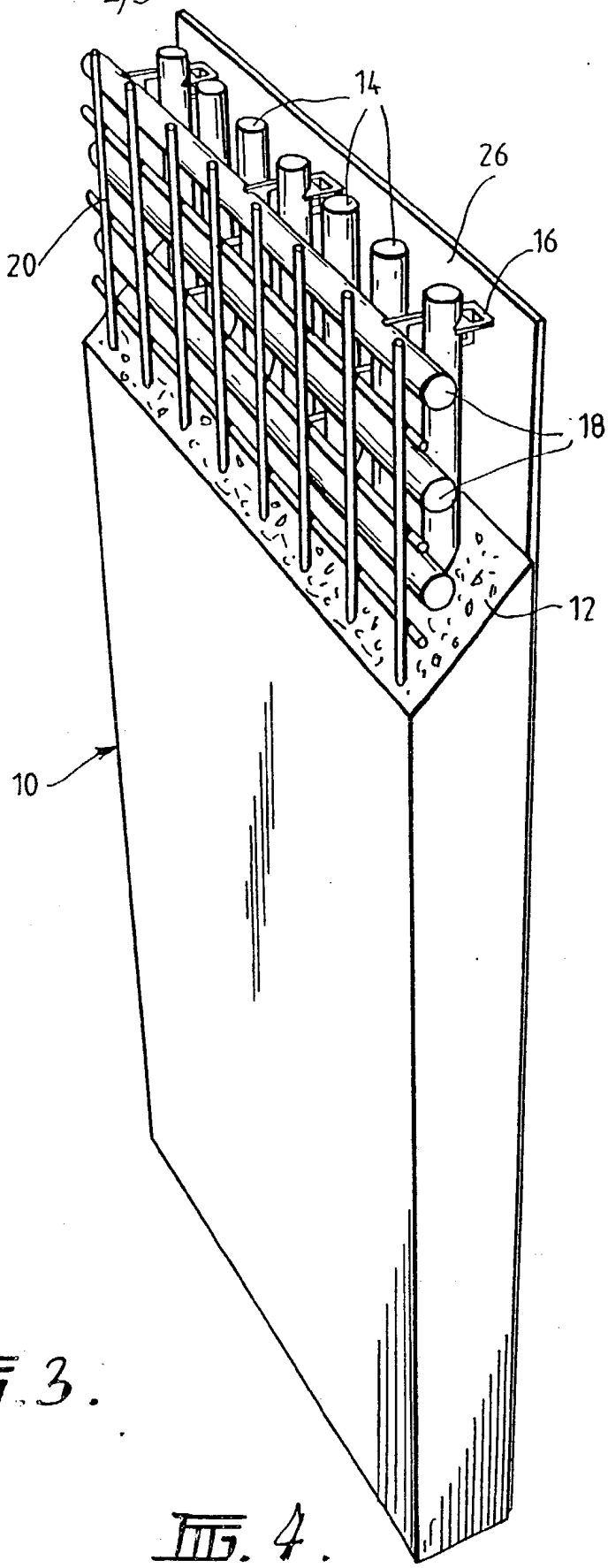

FIG. 4.

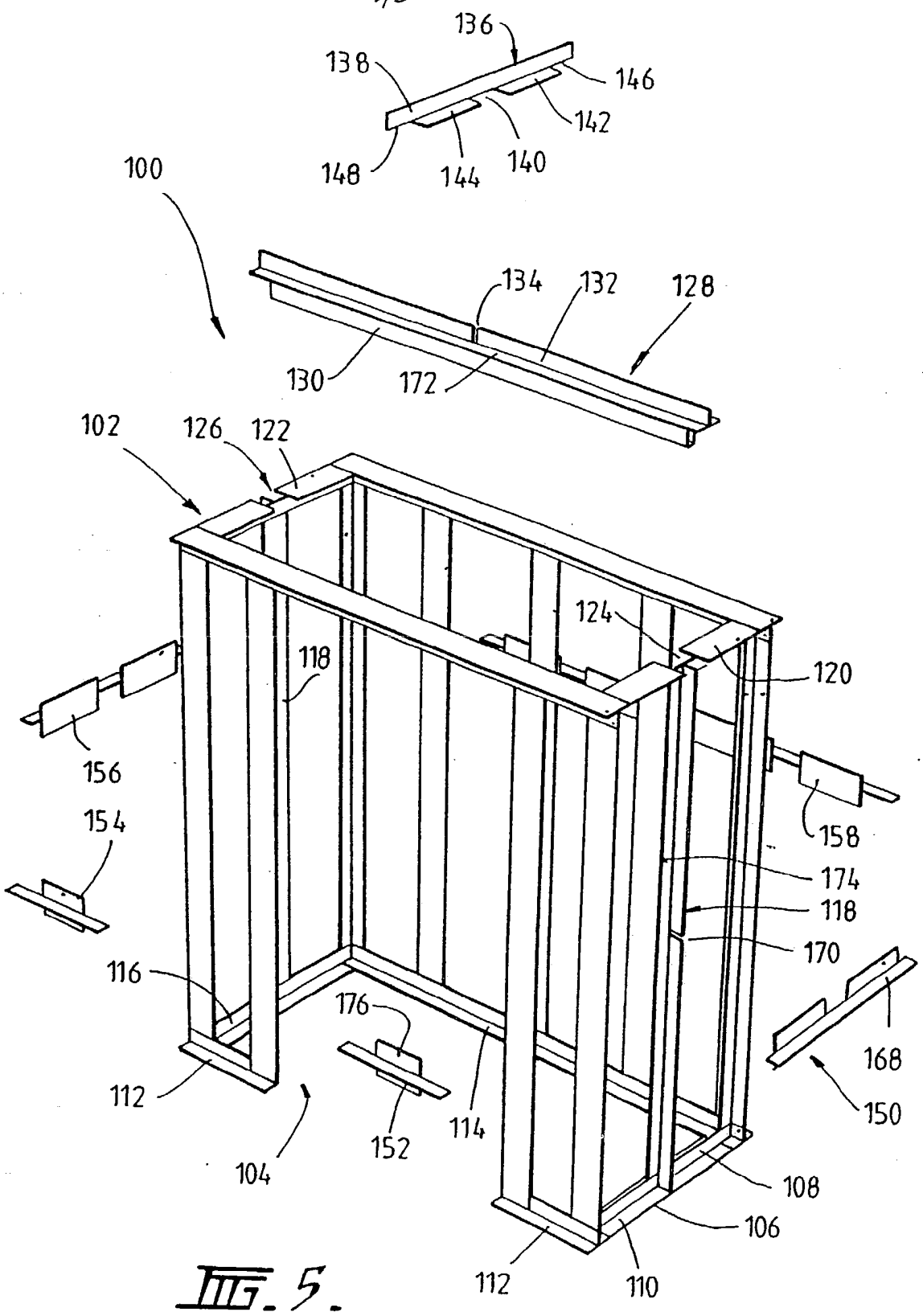
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FIG. 5.

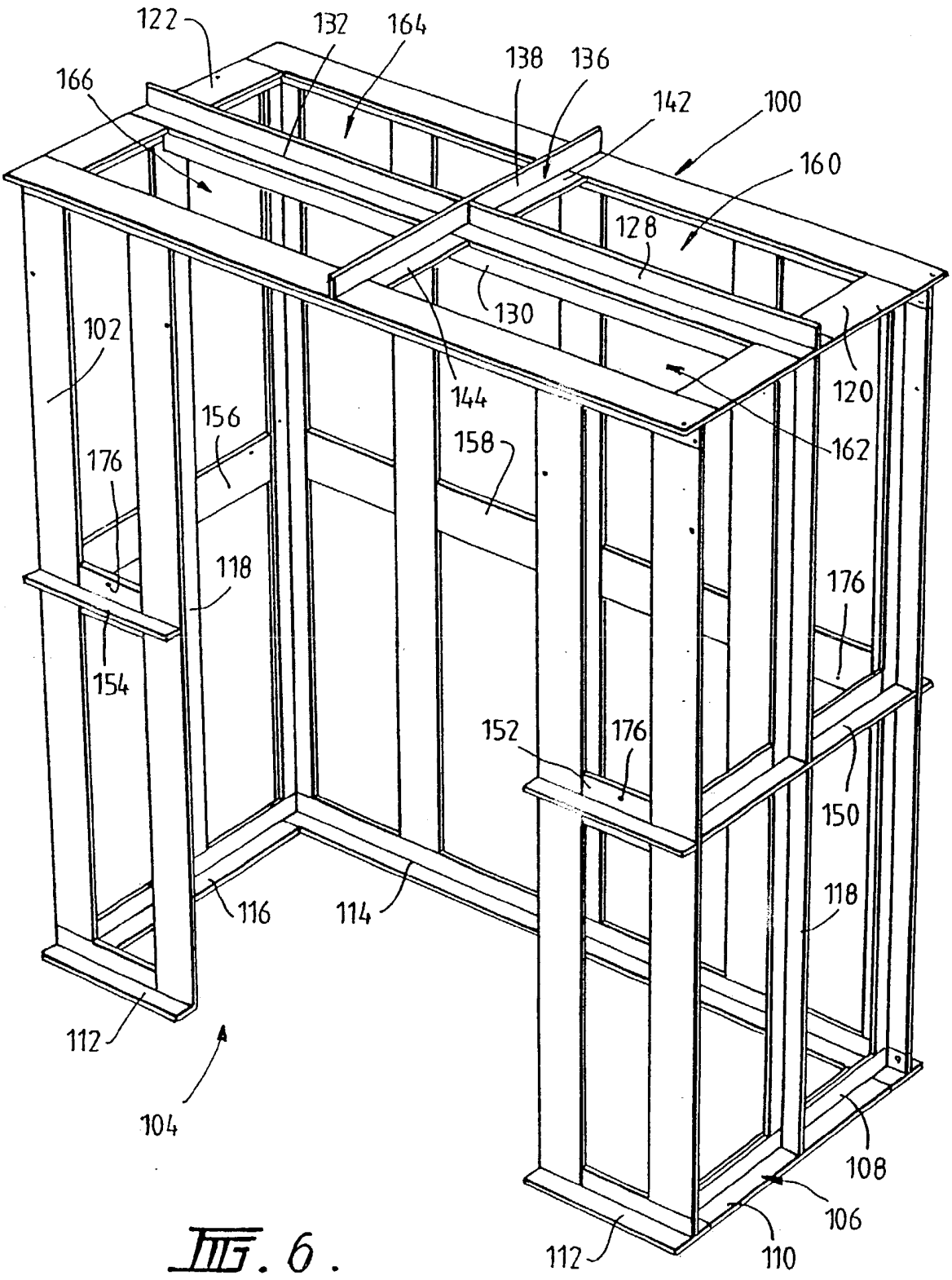
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FIG. 6.

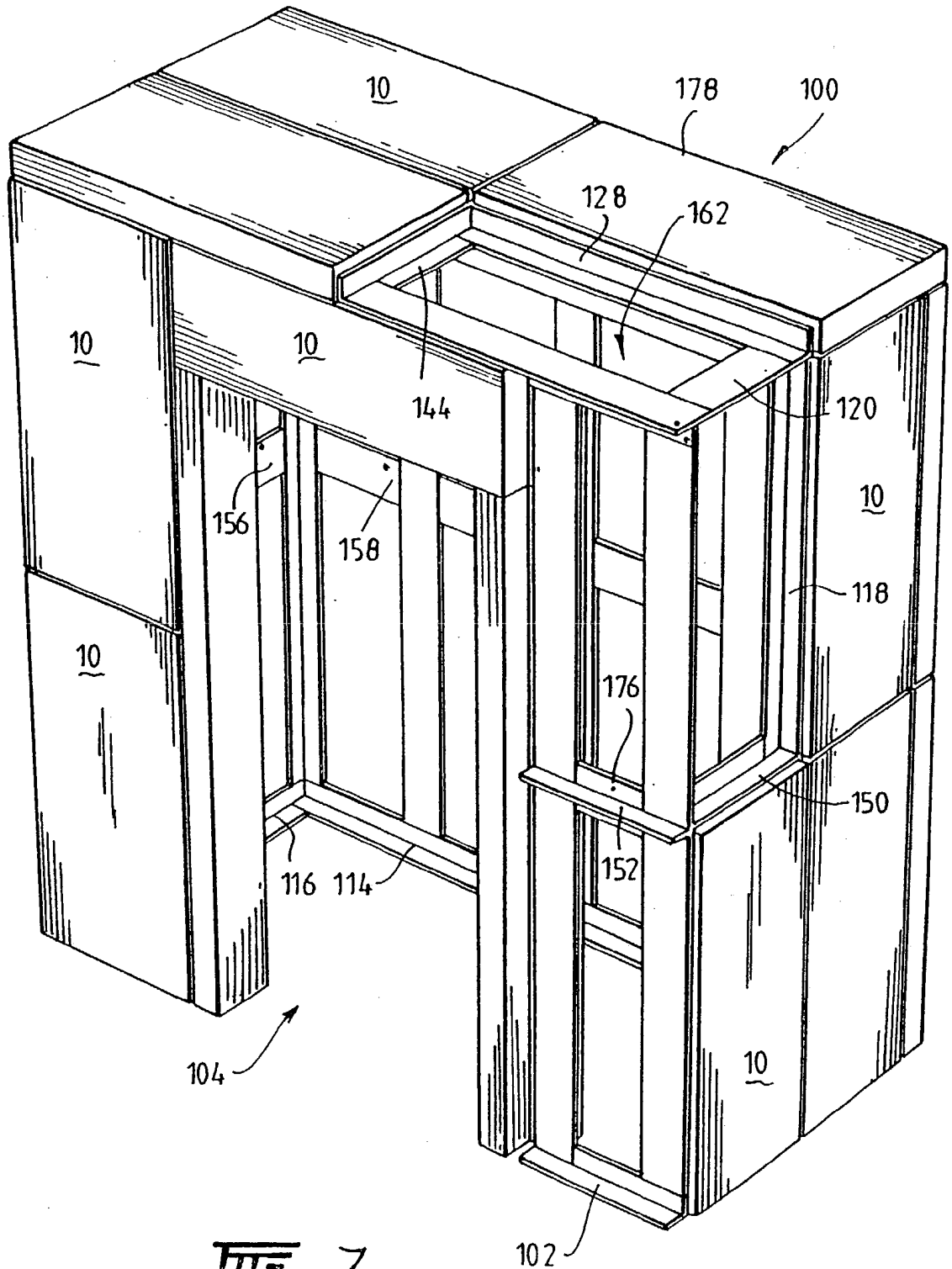
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FIG. 7.

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl.[5] E05G 1/024, 1/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC E05G 1/024, 1/02, 1/00

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to Claim No.
X	US,A, 3453974 (GERARD) 8 July 1969 (08.07.69) See col 2 line 49 to col 3 line 40	1-9
X Y	DE,A, 2837805 (BOCHUMER EISENHUTTE HEINTZMANN GmbH & CO) 13 March 1980 (13.03.80)	1 1-3,5-9
X Y	DE,A, 2614968 (MYRTHA) 20 October 1977 (20.10.77)	10 1-3,5-9

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Date of the actual completion of the international search	Date of mailing of the international search report
22 December 1992 (22.12.92)	31 DEC 92 (31.12.92)

Name and mailing address of the ISA/AU	Authorized officer
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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate of the relevant passages	Relevant to Claim No.
X	US,A, 1605444 (KENNEDY) 2 November 1926 (02.11.26) See page 2 lines 28-54,99-107	10,11,15
X	US,A, 1467419 (BRAUER) 11 September 1923 (11.09.23) See page 1 lines 52-91, Figures 1 & 2	10,15
X	AU,A, 5259/22 (HOLT and WATT) 3 October 1922 (03.10.22)	10,15
X	FR 882270 (LEICHTMETALLBAU REGENSBURG GmbH) 28 May 1943 (28.05.43)	10,15
X	DE,A, 3630653 (STACKE GmbH) 13 March 1988 (13.03.88)	10
A	US,A, 1826768 (GIALDINI) 13 October 1931 (13.10.31)	10,15

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Patent Document Cited in Search Report	Patent Family Member					
US 3453974	BE	665192	BR	6570428	AU	60142/65
	IL	23687	NL	6507792		
						END OF ANNEX